

Special Facilities and Programs

Advanced Materials Characterization Laboratory

McNutt Hall and Straumanis Hall

F. Scott Miller (Director)

smiller@mst.edu

<http://amcl.mst.edu>

The Advanced Materials Characterization Laboratory was established in 2001 to provide advanced materials characterization instrumentation and expertise to Missouri S&T researchers as well as technological industries in Rolla and the state of Missouri. The laboratory combines advanced analytical resources from several departments on campus, as well as the Materials Research Center to provide a centralized point of contact for researchers.

The characterization equipment available in the AMCL includes: a dualbeam Focused Ion Beam/Scanning Electron microscope instrument, two scanning electron microscopes (SEM), and a transmission electron microscope (TEM), all of which are combined with energy dispersive X-ray Spectroscopy (EDS) systems, a four-spectrometer electron microprobe, two x-ray diffractometers, scanning tunneling and atomic force microscopes, auger electron and x-ray photoelectron spectrometers, and instruments for thermal analysis, including thermogravimetric analysis and differential scanning calorimetry. Training in these methods and assistance in the use of the equipment are provided to faculty researchers, graduate and undergraduate students by the director and staff of the AMCL.

Center for Aerospace Manufacturing Technologies

320 Engineering Research Lab

Ming C. Leu (Director)

Internet: <http://campus.mst.edu/camt>

Faculty: J. Baird, R. Brow, K. Chandrashekhara, L. Dharani, F. Dogan, J. Drewniak, R. Dubroff, W. Fahrenholtz, G. Galecki, G. Hilmas, W. Huebner, S. Kharkivskiy, M. Koledintseva, U. Koylu, K. Krishnamurthy, M. Krogh, R. Landers, S. Lee, F. Liou, F. Miller, R. Mishra, S. Murray, J. Myers, S. Neal, J. Newkirk, M. O'Keefe, T. O'Keefe, D. Pommerenke, V. Richards, J. Sarangapani, T. Schuman, R. Schwartz, J. Sheffield, J. Stanley, J. Stoffer, D. Summers, H. Tsai, D. Van Aken, Y. Zing, R. Zoughi.

The mission of the Center for Aerospace Manufacturing Technologies (CAMT) is to serve as a center of excellence to research, develop, evaluate and demonstrate new and optimal methodologies and tools for the rapid and cost-effective manufacture of aerospace components and products and to promote new education and training programs for the evolving aerospace

manufacturing workforce, resulting in significant technological advancement and national economic impact.

CAMT was established in May 2004 at Missouri S&T in partnership with Boeing Phantom Works in St. Louis, Missouri through major funding from the Air Force Research Laboratory in Dayton, Ohio, with the following objectives:

- Research, develop, evaluate, demonstrate and transfer advanced technologies of critical importance to the Air Force and the aerospace supply chain in the United States.
- Create knowledge, methodologies and tools to improve affordability, rapidity, quality, productivity, reliability, and safety in aerospace manufacturing.
- Disseminate the generated results to the aerospace supply chain through direct technology transfer as well as education, training and outreach activities.
- Serve as a role model of university-industry-government collaborative relationship.

CAMT involves over forty faculty members and over a hundred research staff and students from academic disciplines including mechanical and aerospace engineering, electrical and computer engineering, materials science and engineering, chemical and biological engineering, mining engineering, engineering management, and chemistry.

CAMT has an array of technologies devoted to advancing manufacturing fabrication and assembly. The interdisciplinary teams, along with advanced equipment and facilities, have created a substantial technology force at Missouri S&T. Realizing the value and importance of CAMT to the entire U.S. aerospace industry, a CAMT Industrial Consortium has been established. Through this, CAMT benefits all consortium members, and its R&D activities are directed by the consortium members. For more information, visit the website at campus.mst.edu/camt.

Center of Excellence for Aerospace Particulate Emissions Research

Norwood Hall G-11

Prof. Philip D. Whitefield, (Director)

pwhite@mst.edu

The MSTCOE is a university/industry consortium coordinated by Missouri University of Science and Technology conducting critical research that is providing the tools to characterize, measure, and predict propulsion particulate emissions in current and future aircraft. These tools will be validated both in the field and in realistic laboratory test environments that integrate propulsion altitude cells with state-of-the-art diagnostic systems and numerical modeling, and will be used as much needed consistent standards for current and future engine design

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by the U.S. and for characterizing the aircraft component of combustion emission in the assessment of local air quality in and around our airports.

NASA FAA TC Center of Excellence for Noise and Emissions

Missouri S&T is the lead university for emissions studies in the recently established NASA FAA TC Center of Excellence for Noise and Emissions. Our objectives are to characterize the emissions (both small particles and condensable gaseous species) from aircraft and airports through measurements, understanding and model the microphysical processes associated with particle formation, and determine the health effects of emissions. The characterization of emissions from aircraft and airports requires comprehensive measurement of small particles and condensable gaseous species. In fact, it requires measurement of both the emissions of individual airplanes as they contribute to the total aircraft segment of the emissions budget of an airport, and the emissions at the fence line of the airport due to all airport operations.

The major tasks of the COE are:

- 1: Analyze and Correlate Particle Concentration Data
- 2: Study quantifying emission indexes
- 3: Develop Field Testing Data

Questions, e-mail pwhite@mst.edu or visit our website at: coe.mst.edu.

Center for Friction Stir Processing

234 McNutt Hall
Rajiv S. Mishra (Director)

The Center for Friction Stir Processing (C-FSP) was approved in Nov. 2002. From 2005, the center became a site for the National Science Foundation (NSF) Industry/University Cooperative Research Center (IUCRC) for Friction Stir Processing. The primary objective of the center is to enhance the science and technology of friction stir processes. Friction stir processing is the only solid state technology that is capable of producing wide-ranging microstructural modifications at localized regions of interest. Friction stir processing is an emerging technique based on the principles of friction stir welding (FSW). This relatively new joining process was developed initially for aluminum alloys, by The Welding Institute (TWI) of the UK. It is a solid-state joining method that is energy efficient, environmentally friendly, and versatile. It is considered by many to be the most significant development in metal joining in a decade. Several new concepts have been developed in the last few years to broaden the impact of friction stir technologies. These concepts make friction stir processing a generic tool for localized microstructural modification and manufacturing. The key technological areas are:

- Friction stir welding
- Friction stir processing for superplasticity
- Friction stir casting modification
- Friction stir microforming

Friction stir powder processing

Friction stir channeling

The C-FSP has state-of-the-art facilities that include a three-axis friction stir machine, a six-axis robotic friction stir machine and a friction stir spot welding machine. E-mail rsmishra@mst.edu or visit our web site at: www.mst.edu/~fricstir.

Design Engineering Center

109 Engineering Management Building
Kenneth M. Ragsdell (Director)

The Design Engineering Center is a unique industry, government, university research partnership. The purpose of the Center is two-fold: to address the universal need for effective design and manufacturing methodology in support of efficient product development, and to provide quality educational opportunities to properly prepare and motivate students (undergraduate, graduate, and practicing engineers). The Center is a research activity in the Engineering Management and Systems Engineering Department. The current organization consists of a director, a number of graduate and undergraduate students, and participating faculty. Current areas of research include total quality management, concurrent engineering, Taguchi Methods®, quality engineering, six sigma and design for six sigma, the product development process, and design optimization. E-mail ragsdell@mst.edu or visit our website at <http://dec.mst.edu/>.

Engineering Education Center at St. Louis (EEC)

Telecommunity Center Bldg.
University of Missouri-St. Louis Campus
Victor Birman (Director)

The Missouri S&T Engineering Education Center, located on the UM-St. Louis campus, offers Missouri S&T courses and degrees to working engineers and scientists in the St. Louis area. The courses, offered in the evenings, are graduate credit courses, applicable to M.S. or Ph.D. degrees. In addition, the Center offers graduate certificate programs. Most of the courses can also be taken by non-degree candidates for personal enhancement.

The M.S. may be earned in aerospace, civil, computer, electrical, manufacturing and mechanical engineering, computer science, information science and technology, and engineering management. Offerings may be expanded if warranted by interests and requirements of area students.

Requirements for the M.S. degree at the Missouri S&T Engineering Education Center are identical to those on the Rolla campus. Courses are taught by Missouri S&T faculty and by Missouri S&T-approved adjunct faculty (industrial research engineers and scientists).

The center was established in 1964, as a part of the continuing education programs at Missouri S&T. Over 2,700 engineers obtained M.S. degrees at the Center.

Further information can be obtained from the director, at One University Blvd., St. Louis, MO 63121, phone 314-516-5431. E-mail dbenenat@mst.edu or visit our website at <http://eec.mst.edu>.

Experimental Computation Laboratory

**308 Computer Science Building
Bruce McMillin (Director)**

The Experimental Computation Laboratory (ECL) is an organization dedicated to research in advanced methods of distributed and parallel computation. The current focus is on the use of rigorous mathematics through formal methods to create fault-tolerant and secure realtime distributed computing systems applied to critical infrastructure protection. This area is known as Cyber-Physical Systems. The laboratory supports undergraduate, graduate, and faculty researchers.

E-mail us at ff@mst.edu or visit our current project website at <http://filpower.mst.edu>.

Experimental Mine

**Bridge School Road
J.C. Tien (faculty member responsible)**

The Experimental Mine, situated on Bridge School Road 1.5 miles from the main campus, consists of 25 acres of surface and underground facilities which provide excellent opportunities for mineral engineering teaching and research. The surface land includes several dolomite quarries. The underground workings consist of four shafts and 1,500 feet of single-level drifts.

This excellent teaching facility is equipped with a variety of mine-related equipment which offer practical hands-on experience in critical topics. This includes air compressors, rock drills, mucking machine, slusher and motor, diamond core drill, blasting seismography, extensometers, and surveying instruments. A complete ventilating fan system is connected to the underground area, appropriately installed for experimental data collection. The mine classroom has internet access and is equipped with an overhead projector, surround sound, and other teaching facilities.

Recent faculty and students research has been conducted in the areas of rock blasting, mine ventilation and atmospheric control, rock mechanics, and pipeline transportation. The quality of facilities is indicated by the frequency of requests for government and industrial use of the premises. Student projects, however, retain priority on this equipment and the working areas.

E-mail mining@mst.edu or visit our web site at: <http://mining.mst.edu/research/depexpmine.html>.

High Pressure Waterjet Laboratory

**Rock Mechanics Facility
Grzegorz Galecki (Director)**

The High Pressure Waterjet Laboratory (HPWL) has been established as a separate group within the Rock Mechanics and Explosives Research Center (RMERC).

For over three decades Missouri S&T has built an international reputation in the area of high-pressure waterjet cutting and cleaning. During that time the technology has moved out of the laboratory and into industry with a broad band of applications. In the past, through contracts that have been awarded, faculty researchers in the RMERC have pursued many of these applications. The establishment of the waterjet laboratory as a separate substructure provides a focus for research activities in the waterjet field and recognizes Missouri S&T's leadership in waterjet research.

Fields to be encompassed within the laboratory include the areas of waterjet cutting; surface preparation of concrete and steel structures; accelerated cavitation studies; prevention of material erosion; processes supported by waterjet; two- and three-phase flow; the mechanism of fluid jet generation and the physics of high speed jet impact; high-pressure jet cutting; high-pressure jet cleaning; high-speed fluid cavitation; the mechanisms of surface erosion; two-phase fluid flow, including the addition of particulates to the jet stream; the mechanisms of fluid jet generation; multi-axis milling in mining and manufacturing; and the surface physics of fluid impact. Applications include mining, civil engineering, industrial and military uses.

The Laboratory serves as an inter-disciplinary campus research facility. State-of-the-art equipment provides support to special needs of manufacturing, military and environmental industries.

E-mail: dsummers@mst.edu or visit our website at <http://rockmech.mst.edu>.

Institute for Applied Chemistry and Nuclear Magnetic Resonance

**Schrenk Hall
Klaus Woelk (Director)**

The Institute for Applied Chemistry and Nuclear Magnetic Resonance was established by the Chemistry Department in 1990.

The purpose of this Institute is to provide a research group that can focus on problems relating to applied chemistry. In addition, the funding partially supports the operation of the Nuclear Magnetic Resonance (NMR) Laboratory, supervised by Dr. Frank Blum. The NMR instrumentation is multi-disciplinary and is used by many researchers on campus.

Members of the Institute include: Dr. R. G. Brow, Dr. H. Collier, Dr. N. Leventis, Dr. P. Reddy, Dr. T. Schuman, Dr.

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L. Sotiriou-Leventis, Dr. P. Stavropoulos, Dr. J. Switzer, Dr. T. Tokuhito, Dr. M. Van De Mark, Dr. K. Woelk.

The Institute promotes the study of chemical solutions to practical problems in the areas of polymers, coatings, solvents, surfactants, thin films, and environmental science. The specific interest is the behavior of polymers and biopolymers, coatings, composites, and conducting materials, as well as the discovery of new types of materials by use of chemical synthesis and novel techniques. The transport of molecules in colloidal and polymer systems is being studied by several researchers. The structure and dynamics of surfactant-based systems, including micelles, microemulsions, liquid crystals, and colloidal dispersions, are being studied as well. The development of chemical processing methods and the production of nano-scale and ceramic materials are also of interest.

Institute for Chemical and Metallurgical Process Development

Straumanis-James Hall
Matthew J. O'Keefe (Director)

The structure, properties, and performance of materials are influenced by the processes used during synthesis and fabrication. Development of the theoretical and practical requirements of these chemical and metallurgical processes are the focus of the institute. Drawing upon traditional hydro, pyro, and electrometallurgical processing operations, the institute investigates a wide range of materials that are of technological importance. Emphasis areas include, but are not limited to, electrochemical processing, corrosion, environmentally benign materials and processes, thin films and coatings, surface modification technologies, and packaging materials. Characterization and analysis of materials and processes using advanced experimental and computational techniques and state of the art equipment are emphasized.

E-mail address is mjokeefe@mst.edu.

Missouri Institute for Computational and Applied Mathematical Sciences

Rolla Building
Stephen L. Clark (Director)

The interweaving of computational sciences and mathematics remains one of the most significant driving forces in the development of science and technology. The institute promotes the development of multidisciplinary research communities engaging applied mathematicians, computational scientists and engineers in innovative research on important scientific and technological problems. In pursuit of its mission, the institute supports research, provides educational opportunities at all levels,

and serves as a resource for the state in support of high-technology industrial development.

E-mail address is mathstat@mst.edu or visit our website at: <http://math.mst.edu/research/applied-mathematics.html>.

Institute of River Studies Environmental Hydraulics and Hydrology

Butler-Carlton Civil Engineering Hall
C.D. Morris (Director)

Water and water-resource problems are often comprehensive in nature and their complexity is such that their resolution requires cooperative effort from individuals from a wide variety of academic backgrounds. The purpose of this institute is to encourage and to foster interdisciplinary team research directed toward resolution of the water and water-resources problems of Missouri and the nation.

The focus of institute activity is on the nation's natural waterways. In particular, the institute has a long record of research into problems related to major rivers in the midwest. The institute helps bring academics together with agencies, companies and industries to initiate research. The institute assists in assembling potential research collaborators and in preparation of proposals.

E-mail address is: morris@mst.edu.

Laboratory for Atomic, Molecular and Optical Research

Physics
Michael Schulz (Director)

The Laboratory for Atomic, Molecular and Optical Research is composed of Missouri S&T faculty members performing research in atomic molecular and optical physics. This scientific area is concerned with the few body problem, the structure of atoms and molecules and their interaction with each other, with electromagnetic fields, and with surfaces.

The laboratory provides an environment which enhances this research activity, and which fosters cooperation and collaboration. The laboratory also provides a structure for formal cooperative programs, group funding, and other collective scientific activities.

Basic studies in the atomic, molecular and optical sciences have made major contributions to many of the new technologies that exist today. Laboratory faculty and staff members continue to contribute to the development of advanced concepts in such wide ranging areas as femtosecond laser physics, atomic interaction dynamics for electron, positron, and ion impact, and atomic processes important in controlled nuclear fusion.

E-mail: schulz@mst.edu or visit our website at: <http://physics.mst.edu>.

Laboratory for Information Technology Evaluation

Bureau of Mines #1
Richard Hall (Director)

The Laboratory for Information Technology Evaluation (LITE) and affiliated Center for Technology Enhanced Learning support the prototyping and evaluation of advanced information technologies and new media systems, with a particular focus on interactive learning simulations. The lab includes a number of computer work stations, which include state of the art prototyping and new media development software, for LITE Graduate and Undergraduate research assistants, and a usability assessment station. The usability equipment allows for the dynamic recording of users' navigation through information systems, and simultaneous recording of users' facial expressions and audio protocol, via Morae usability software. The system is also capable of acquisition and analysis of physiological responses, using the Biopac system.

In addition, the lab includes a head mounted display for research with virtual environments. The system allows for a detailed qualitative and quantitative evaluation of the usability of a wide variety of software.

E-mail rhall@mst.edu or visit our website at <http://lite.mst.edu>.

Natural Hazards Mitigation Institute

Neil Anderson (Director)
nanders@mst.edu

The State of Missouri is subject to natural hazards that cause widespread damage to residential, corporate and public structures, and transportation facilities and other infrastructure. Natural hazards include earthquakes, floods, tornados, high velocity straight winds, forest fires, ground collapse, expansive soil failure, and dam and levee failure. Such hazards result in significant economic costs and even loss of life.

Many of these natural hazard events have common attributes:

- The onset of these disruptive natural forces occur within a short time frame, often with little immediate warning, threatening both lives and property.
- The widespread impact of the event extends over an area and its contents, whether people, domestic dwellings, transportation or civil infrastructure.
- The multiplicative influence of weaknesses in geology and soil stratigraphy can compound structural damage.
- The impact of man's activities can contribute to the problem or can impede access to the area, slowing the needed mitigation and remediation of damage.

The complex and multifaceted nature of these natural hazards, which nevertheless have a common central theme, requires a coordinated and multi-disciplinary

approach to develop a strategy to provide protection to people and vulnerable structures before an event, to minimize injury and damage during the event and to ease the requirements for remediation after it is over. This requires a deep understanding and awareness of the areas at risk, if mitigation, response and remediation procedures are to be effectively developed.

The Missouri S&T Natural Hazards Mitigation Institute (NHMI) is charged with mitigating and remediating the detrimental effects of natural hazards both within the State of Missouri and nationally, through research, public service and education. More specifically, the Missouri S&T NHMI is charged with the following responsibilities:

- Conduct, lead, coordinate and otherwise facilitate interdisciplinary research in the broad area of natural hazards including likelihood of occurrence, cause, effects, mitigation and remediation.
- Provide and disseminate public service information regarding probability of natural hazard occurrences, their potential outcomes, and precautionary measures which can minimize detrimental effects of natural hazards.
- Prepare, sponsor, coordinate and otherwise facilitate the development and offering of educational courses (academic and training) in the broad area of natural hazards.

Office of Technology Commercialization and Economic Development

Centennial Hall
Keith Strassner (Director)

The Office of Technology Transfer and Economic Development (OTTED) serves as the focal point for entrepreneurship, economic development, technology transfer and technology commercialization within the Missouri S&T, and as such functions as a resource for the development, dissemination, and implementation of enabling discoveries to commercial partners. The OTTED provides the means for applying these practices by offering business development and technology commercialization assistance to University and business ventures. The office actively brings together the organizations, resources, and processes that will efficiently develop the university's discoveries for the betterment of society and the University.

The OTTED offers university faculty and students what they need to transfer technologies and create a start-up business by bringing new technologies to the widest possible audience through the commercialization of these discoveries. Through its programs, services, and efforts, OTTED is laying the ground work for the creation of new products, new jobs, and new opportunities for America. To efficiently meet the needs of Missouri S&T for technology transfer and commercialization support, OTTED consists of a Technology Transfer Office (TTO) and the Small Business Technology Development

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Center(SBTDC). Both groups work closely together and with the University of Missouri's Office of Research and Economic Development to provide responsive, professional service to our faculty, students and industry partners to facilitate the creation of wealth, jobs and opportunities for faculty, staff, students and business within the state of Missouri and the world.

The TTO provides technology transfer expertise for identifying high-value innovative research, assessment of the licensability of Missouri S&T research, and securing intellectual property protection (when appropriate) for those inventions. The professional staff works with the researcher and faculty to provide advice about technology transfer issues during the research activity and to assist in the invention disclosure process. The TTO also provides guidance on an effective patent and copyright strategy and handles all the implementation details. To effectively bring Missouri S&T's technology into commercial use, the TTO assists in the technical and market assessments and actively markets Missouri S&T's technologies to industry partners. As part of these activities the TTO will expand and improve the technology transfer process on campus to ensure responsiveness to faculty, open and transparent decision making, and industry friendly interaction with potential licensees to ensure access to the public and support the University's strong commitment to economic development initiatives.

The SBTDC integrates the activities of faculty, students and inventors by linking with technology-based small businesses to create commercialization opportunities, offer short courses and seminars on entrepreneurship, showcase technologies to government and industry partners, and identify business issues that require public policy attention. Business assistance programs offered by SBTDC include the SBIR/STTR, LWI, MO PTAC, and University of Missouri Extension.

A start-up business has the potential to produce significant opportunities for the inventors, the University, and the community. Given the right circumstances a start-up company can bring a technology to market more quickly, increase the value of a technology to outside partner companies, and aid University research activities. SBTDC's professional staff provides proactive assistance in analyzing potential opportunities to form a start-up business with Missouri S&T's technology and encourage this interaction early in the disclosure process. In all cases, a new start-up business must make a compelling case to investors, inventors, business partners, and the University that it can attract funding and resources to achieve sustainable success. SBTDC's staff provides hands on business assistance and links to funding and people resources.

The Small Business Innovation Research and Small Business Technology Transfer Program (SBIR/STTR) is a unique partnership among the Missouri University of Science & Technology, University of Missouri Extension and its partners, to bring government research and development awards to the small business and faculty. The staff can help you seek out, apply for and win government SBIR awards. The SBIR program is designed to:

- 1) stimulate technological innovation;
- 2) partner with small businesses to meet federal research and development needs;
- 3) encourage the participation of disadvantaged businesses and minority-owned firms in technological innovation; and
- 4) increase private sector commercialization derived from federal research and development funding.

The program offers small technology-based companies the opportunity to obtain seed capital for research and development early in the innovation process.

Dealing with regulations and red tape can be frustrating. In fact, those obstacles often keep highly qualified suppliers from selling to the government. The Missouri Procurement Technical Assistance Centers assist businesses-including small, disadvantaged and women owned firms-in obtaining federal, state and local government contracts. Procurement specialists will help you in identifying opportunities and understanding the government contracting process so you can take advantage of government sales dollars.

University Missouri Extension provides research-based knowledge and problem-solving resources from the University of Missouri to citizens, communities and businesses at the local level. Specialists in each county center can assist you directly or put you in touch with statewide experts and resources to serve your needs. The Business Development Program seeks to provide a seamless network of business support services that are proactive in anticipating needs, responsive to Missourians, effective in assistance and efficient in delivery to Missouri entrepreneurs and businesses, with outcomes that result in maximizing Missouri's economic viability, individual capacity, families, communities and environment.

The OTTED also operates a student business incubator. The objective of the student business incubator is to encourage student entrepreneurship at Missouri S&T. The student business incubator provides resources and services to new business ventures started and operated by students at Missouri S&T. This includes work space, a business mailing address, ongoing business counseling, and access to shared resources such as a conference room, copier, printer, scanner, and fax machine. Only student businesses are eligible to participate in the student business incubator.

For more information about technology and business development efforts at Missouri S&T, contact us at otced@mst.edu or visit our website at <http://ecodevo.mst.edu>.

South Central Regional Professional Development Center

**800 University Drive
John Lewis (Director)**

The South Central Regional Professional Development Center (SCRPDC) one of nine in Missouri, is funded primarily through SB380 The Outstanding Schools Act by the Department of Elementary and Secondary Education. The SCRPDC currently operates under the Office of Undergraduate Studies. The mission of the SCRPDC is to support excellence and equity in education through the continual improvement of the professional competencies of Missouri educators. Based on the National Standards for Staff Development, the SCRPDC will enhance the quality of teaching, learning and contribute to the discovery of innovative models for the improvement of education. The Center strives to increase the performance of students in the region by building the capacity of Missouri's teaching and administrative staff through professional development. To do so, the SCRPDC organizes and implements workshops, role-alike network groups, study groups, on-going school improvement initiatives and on-site consultations. The SCRPDC provides information and resources for public school educators in proven instructional and administrative practices that promote quality instruction, overall school improvement and school linked services for children and their families. The SCRPDC serves as a coordination site or hub for the region's learning community.

The target population for the work of the SCRPDC is the 58,554 students and 5,266 educators in the region. The SCRPDC officially serves 63 school districts in the counties of Crawford, Dent, Franklin, Howell, Iron, Maries, Oregon, Phelps, Pulaski, Reynolds, Shannon, Texas, and Washington. The Center also provides services to educators from an additional 40 districts from surrounding counties. The Center's programs and services are available free of charge to Missouri S&T faculty, staff, and education students. Contact us at rpdc@mst.edu or visit our website at <http://rpdc.mst.edu>.

Student Design and Experiential Learning Center

**112 ERL
Paul Hirtz (Director)**

The Student Design and Experiential Learning Center (SDEL) was established in 2000 with the specific purpose of consolidating support and management of the multi-disciplinary, student design teams that existed independently at the Missouri University of Science and Technology. In 2004, a successful UM System Strategic Initiative proposal expanded the Center's mission to provide experiential learning in academic courses, identify and support student service learning projects within the curriculum, and support ad-hoc student teams in specialty academic events supporting multi-disciplinary student research.

Under the new mission, the Center took steps to better fund our ten nationally competitive student design teams that involve over 500 students from all campus departments. We also began offering support and resources to special project teams that were multi-disciplinary in nature and had a research base to their activities. The SDEL offers academic credit opportunities in the form of three one-hour classes on design, leadership and communication. The Center also offers a course through the Residential College (RC) program on experiential design. The RC program currently has an enrollment of over 100 students (each semester) actively engaged in hands-on learning projects. In summary, the SDEL supports four major types of experiential learning today: 1) student design teams, 2) course implementation of experiential learning, 3) service learning and 4) multi-disciplinary design research projects.

Visit our website at: design.mst.edu; call 573-341-7546, or E-mail: sdelc@mst.edu.

Wei-Wen Yu Center for Cold-Formed Steel Structures

**Butler-Carlton Civil Engineering Hall
Roger A. LaBoube (Director)
Wei-Wen Yu (Founding Director)**

To meet an ever-increasing demand for technical assistance from steel and construction industries and to create more economic designs and applications, the Missouri S&T Wei-Wen Yu Center for Cold-Formed Steel Structures (CCFSS) was established to provide an integrated approach for handling research, teaching, and technical services on cold-formed steel structures at Missouri S&T. The Center brings together technical resources from universities, trade associations, research laboratories, steel producers, manu-facturing companies, consulting engineers, building officials, governmental agencies, and others.

The Center is currently co-sponsored by the American Iron and Steel Institute, Cold-Formed Steel Engineering Institute of the Steel Framing Alliance, Metal Building Manufacturers Association, Rack Manufacturers Institute, Steel Deck Institute, Steel Stud Manufacturers Association, and the Missouri University of Science & Technology.

Since 1968 Missouri S&T has conducted numerous research projects on cold-formed steel structures. These projects have been supported by the American Iron and Steel Institute, National Science Foundation, the American Society of Civil Engineers, Metal Building Manufacturers Association, Metal Lath/Steel Framing Association, the Steel Deck Institute, the Chromium Centre in South Africa, The Nickel Development Institute in Canada, the Specialty Steel Industry of the United States, and individual companies.

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With regard to teaching, Missouri S&T is one of few universities to offer a graduate course on cold-formed steel structures. In addition to the regular course, Missouri S&T has regularly conducted short courses and international specialty conferences to provide continuing education programs for the engineering profession. Visit our website at <http://ccfssonline.org>.